

## WHAT IS CLAIMED IS:

1. A system for predicting the timing of a future service event of a product formed from a plurality of compartments, comprising:

a database that contains a plurality of service information and a plurality of performance information for the product;

5 a statistical analyzer that analyzes the plurality of service information to determine a plurality of compartment failure information;

a performance deterioration rate analyzer that analyzes performance deterioration rate of the product from the plurality of service information and performance information; and

10 a simulator for simulating a distribution of future service events of the product according to the plurality of compartment failure information and the performance deterioration rate analysis.

2. The system according to claim 1, wherein the database comprises a service database and a performance historical database.

3. The system according to claim 1, wherein the plurality of service information comprises compartment definitions, repair history and service factors.

4. The system according to claim 1, wherein the plurality of performance information comprises performance characteristic values, initial data levels after servicing, current data levels, dates at which the product is serviced, and variables that affect the servicing of a subset of the plurality of compartments.

5. The system according to claim 1, further comprising a preprocessor for processing the plurality of service information into a predetermined format.

6. The system according to claim 1, wherein the preprocessor generates a plurality of data files according to the plurality of service information.

7. The system according to claim 1, wherein the plurality of compartment failure information comprises compartment failure variables and compartment time-to-failure coefficients.

5 8. The system according to claim 7, wherein the statistical analyzer uses the plurality of compartment failure information to determine which compartment failure variables influence the timing of future service events and estimate time-to-failure distributions for the plurality of compartments.

10 9. The system according to claim 8, wherein the statistical analyzer uses the estimated time-to-failure distributions to determine a Weibull distribution for a subset of the plurality of compartments defined for the product.

10. The system according to claim 1, wherein the statistical analyzer comprises a service analysis script that executes a plurality of statistical procedures.

11. The system according to claim 10, wherein the plurality of statistical procedures comprise a multivariate regression and/or a correlation analysis.

15 12. The system according to claim 10, wherein the service analysis script generates a plurality of statistical diagnostic information.

13. The system according to claim 12, wherein the plurality of statistical diagnostic information comprises goodness-of-fit metrics and collinearity diagnostics.

20 14. The system according to claim 10, wherein the service analysis script generates a plurality of residual plots.

15. The system according to claim 1, wherein the statistical analyzer comprises a validation script.

25 16. The system according to claim 15, wherein the validation script is applied to a plurality of case studies set up for the product.

17. The system according to claim 1, wherein the performance deterioration rate analyzer comprises a statistical analysis script that relates a subset of compartments of the product according to time.

5 18. The system according to claim 17, wherein the statistical analysis script generates an estimated deterioration rate curve for the subset of compartments of the product.

10 19. The system according to claim 18, wherein the performance deterioration rate analyzer further comprises a transformer that transforms each estimated deterioration rate curve for a compartment to a performance life distribution.

20. The system according to claim 19, wherein the simulator uses the performance life distributions to determine a Weibull distribution for a subset of the plurality of compartments defined for the product.

15 21. The system according to claim 1, wherein the simulator forecasts a service plan for the future service events that comprises the time for scheduling the service events.

22. A system for predicting the timing of a future service event of a product formed from a plurality of compartments, comprising:

20 means for containing a plurality of service information and a plurality of performance information for the product;

means for analyzing the plurality of service information to determine a plurality of compartment failure information;

25 means for performing a deterioration rate analysis that determines performance deterioration rate of the product from the plurality of service information and performance information; and

means for simulating a distribution of future service events of the product, according to the plurality of compartment failure information and the performance deterioration rate analysis.

23. The system according to claim 22, wherein the plurality of service information comprises compartment definitions, repair history and service factors.

24. The system according to claim 22, wherein the plurality of performance information comprises performance characteristic values, initial data levels after servicing, current data levels, dates at which the product is serviced, and variables that affect the servicing of a subset of the plurality of compartments of the product.

25. The system according to claim 22, further comprising means for preprocessing the plurality of service information into a predetermined format.

26. The system according to claim 25, wherein the preprocessing means generates a plurality of data files according to the plurality of service information.

27. The system according to claim 22, wherein the plurality of compartment failure information comprises compartment failure variables and compartment time-to-failure coefficients.

28. The system according to claim 27, wherein the analyzing means uses the plurality of compartment failure information to determine which compartment failure variables influence the timing of future service events and estimate time-to-failure distributions for the compartments.

29. The system according to claim 28, wherein the analyzing means uses the estimated time-to-failure distributions to determine a Weibull distribution for a subset of the plurality of compartments defined for the product.

30. The system according to claim 22, wherein the analyzing means comprises a service analysis script that executes a plurality of statistical procedures.

31. The system according to claim 30, wherein the plurality of statistical procedures comprise a multivariate regression and/or a correlation analysis.

32. The system according to claim 30, wherein the service analysis script generates a plurality of statistical diagnostic information.

5 33. The system according to claim 32, wherein the plurality of statistical diagnostic information comprises goodness-of-fit metrics and collinearity diagnostics.

34. The system according to claim 30, wherein the service analysis script generates a plurality of residual plots.

10 35. The system according to claim 22, wherein the analyzing means comprises a validation script.

36. The system according to claim 35, wherein the validation script is applied to a plurality of case studies set up for the product.

15 37. The system according to claim 22, wherein the performing means comprises a statistical analysis script that relates a subset of the plurality of compartments of the product according to time.

38. The system according to claim 37, wherein the statistical analysis script generates an estimated deterioration rate curve for a subset of the plurality of compartments of the product.

20 39. The system according to claim 38, wherein the performing means further comprises means for transforming each estimated deterioration rate curve for a compartment to a performance life distribution.

25 40. The system according to claim 39, wherein the simulator uses the performance life distribution to determine a Weibull distribution for a subset of the plurality of compartments defined for the product.

41. The system according to claim 22, wherein the simulator forecasts a service plan for the future service events that comprises the time for scheduling the service events.

5 42. A method for predicting the timing of a future service event of a product formed from a plurality of compartments, comprising;

storing a plurality of service information and a plurality of performance information for the product;

analyzing the plurality of service information to determine a plurality of compartment failure information;

10 performing a deterioration rate analysis of the product from the plurality of service information and performance information; and

simulating a distribution of future service events of the product according to the plurality of compartment failure information and the deterioration rate analysis.

15 43. The method according to claim 42, wherein the plurality of service information comprises compartment definitions, repair history and service factors.

44. The method according to claim 42, wherein the plurality of performance information comprises performance characteristic values, initial data levels after servicing, current data levels, dates at which the product is serviced, and variables that affect the servicing of a subset of the plurality of compartments of the product.

45. The method according to claim 42, further comprising preprocessing the plurality of service information into a predetermined format.

25 46. The method according to claim 45, wherein the preprocessing generates a plurality of data files according to the plurality of service information.

47. The method according to claim 42, wherein the plurality of compartment failure information comprises compartment failure variables and compartment time-to-failure coefficients.

5 48. The method according to claim 47, wherein the analyzing uses the plurality of compartment failure information to determine which compartment failure variables influence the timing of future service events and estimate time-to-failure distributions for the plurality of compartments.

10 49. The method according to claim 48, wherein the analyzing uses the estimated time-to-failure distributions to determine a Weibull distribution for a subset of the plurality of compartments.

50. The method according to claim 42, wherein the analyzing comprises using a service analysis script that executes a plurality of statistical procedures.

15 51. The method according to claim 50, wherein the plurality of statistical procedures comprise a multivariate regression and/or a correlation analysis.

52. The method according to claim 51, wherein the service analysis script generates a plurality of statistical diagnostic information.

20 53. The method according to claim 52, wherein the plurality of statistical diagnostic information comprises goodness-of-fit metrics and collinearity diagnostics.

54. The method according to claim 50, wherein the service analysis script generates a plurality of residual plots.

55. The method according to claim 42, wherein the analyzing comprises using a validation script.

25 56. The method according to claim 55, wherein the validation script is applied to a plurality of case studies set up for the product.

57. The method according to claim 42, wherein the performing comprises using a statistical analysis script that relates a subset of the plurality of compartments of the product according to time.

5 58. The method according to claim 57, wherein the statistical analysis script generates an estimated deterioration rate curve for a subset of the plurality of compartments of the product.

59. The method according to claim 58, wherein the performing a deterioration rate analysis further comprises transforming each estimated deterioration rate curve for a compartment to a performance life distribution.

10 60. The method according to claim 59, wherein the simulating uses the performance life distributions to determine a Weibull distribution for a subset of the plurality of compartments.

15 61. The method according to claim 42, wherein the simulating forecasts a service plan for the future service events that comprises the time for scheduling the service events.

62. A computer-readable medium storing computer instructions for instructing a computer system to predict the timing of a future service event of a product formed from a plurality of compartments, the computer instructions comprising:

20 storing a plurality of service information and a plurality of performance information for the product;

analyzing the plurality of service information to determine a plurality of compartment failure information;

25 performing a deterioration rate analysis of the product from the plurality of service information and performance information; and



simulating a distribution of future service events of the product according to the plurality of compartment failure information and the deterioration rate analysis.

5 63. The computer-readable medium according to claim 62, wherein the plurality of service information comprises compartment definitions, repair history and service factors.

10 64. The computer-readable medium according to claim 62, wherein the plurality of performance information comprises performance characteristic values, initial data levels after servicing, current data levels, dates at which the product is serviced, and variables that affect the servicing of a subset of the plurality of compartments of the product.

15 65. The computer-readable medium according to claim 62, further comprising preprocessing instructions that preprocess the plurality of service information into a predetermined format.

20 66. The computer-readable medium according to claim 65, wherein the preprocessing instructions generates a plurality of data files according to the plurality of service information.

67. The computer-readable medium according to claim 62, wherein the plurality of compartment failure information comprises compartment failure variables and compartment time-to-failure coefficients.

68. The computer-readable medium according to claim 67, wherein the analyzing instructions uses the plurality of compartment failure information to determine which compartment failure variables influence the timing of future service events and estimate time-to-failure distributions for the plurality of compartments.

25 69. The computer-readable medium according to claim 68, wherein the analyzing instructions use the estimated time-to-failure distributions to determine a Weibull distribution for a subset of the plurality of compartments.

70. The computer-readable medium according to claim 62, wherein the analyzing instructions comprises instructions for using a service analysis script that executes a plurality of statistical procedures.

5 71. The computer-readable medium according to claim 70, wherein the plurality of statistical procedures comprise a multivariate regression and/or a correlation analysis.

72. The computer-readable medium according to claim 71, wherein the service analysis script generates a plurality of statistical diagnostic information.

10 73. The computer-readable medium according to claim 72, wherein the plurality of statistical diagnostic information comprises goodness-of-fit metrics and collinearity diagnostics.

74. The computer-readable medium according to claim 70, wherein the service analysis script generates a plurality of residual plots.

15 75. The computer-readable medium according to claim 62, wherein the analyzing instructions comprise using a validation script.

76. The computer-readable medium according to claim 75, wherein the validation script is applied to a plurality of case studies set up for the product.

20 77. The computer-readable medium according to claim 62, wherein the performing instructions comprise using a statistical analysis script that relates a subset of the plurality of compartments of the product according to time.

78. The computer-readable medium according to claim 77, wherein the statistical analysis script generates an estimated deterioration rate curve for a subset of the plurality of compartments of the product.

25 79. The computer-readable medium according to claim 78, wherein the performing instructions further comprise transforming instructions that transform each estimated deterioration rate curve to a performance life distribution.

80. The computer-readable medium according to claim 79, wherein the simulating instructions use the performance life distribution to determine a Weibull distribution for a subset of the plurality of compartments.

81. The computer-readable medium according to claim 62, wherein the simulating instructions forecasts a service plan for the future service events that comprises the time for scheduling the service events.

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